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REMARKS

Applicants have carefully considered the Final Office Action mailed on July 13, 2007. Of the pending claims, the Examiner rejected claims 1-39. In response to the office action, Applicants amended claims 1, 7, 8, 14, 20, 21, 27, 32, 33 and 39. No new matter has been added. Claims 1-39 remain pending in the present patent application. In view of the above amendments and the following remarks, Applicants request further examination and reconsideration of the present patent application.

Rejections Under 35 U.S.C. 102

Claims 1-6, 10-19, 23-31, 35-39 were rejected under 35 U.S.C 102(e) as being anticipated by US Patent No. US 6,842,638 B1 (hereinafter, "Suri"). Anticipation requires the disclosure in a single prior art reference of each element of the claim under consideration.

Claims 1, 7, 8, 14, 20, 21, 27, 32, 33 and 39 have been amended to more clearly recite the invention. Support for the amendments can be found in Applicants' specification at, for example, page 13, lines 20-22. No new matter has been added.

Claims 1, 14, 27 and 39 and claims depending therefrom

Claims 1 and 14 are directed to a method and computer program for generating a bone mask. The method and computer program comprise the steps of acquiring an image data set and pre-processing the image data set to automatically calculate at least one or more seed points and one or more structure edges. The method and computer program further comprise the step of generating a preliminary bone mask to differentiate bone and vascular structures from the image data set, wherein the preliminary bone mask is generated for a plurality of sub-volumes comprising the image data set, based upon a spatial relationship between the bone and the vasculature structures in the plurality of sub-volumes, wherein each sub-volume is differentially processed based upon the spatial relationship between the bone and vascular structures in the sub-volume. The method and computer program then comprise automatically determining the vascular structure using the one or more seed points, the one or more structure edges, and the image data and subtracting the vascular structure from the preliminary bone mask to generate a bone mask.

Claims 27 and 39 are directed to a CT image analysis system. The system comprises an X-ray source configured to emit a stream of radiation and a detector configured to detect the

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stream of radiation and to generate one or more signals responsive to the stream of radiation, wherein the detector comprises a plurality of detector elements. The system further comprises a system controller configured to control the X-ray source and to acquire a set of image data from one or more of the detector elements via a data acquisition system. The system further comprises a computer system configured to receive the set of image data, to pre-process the set of image data to automatically calculate at least one or more seed points and one or more structure edges, to generate a preliminary bone mask to differentiate bone and vascular structures from the set of image data, wherein the preliminary bone mask is generated for a plurality of sub-volumes comprising the image data set, based upon a spatial relationship between the bone and the vascular structure in the plurality of sub-volumes, wherein each sub-volume is differentially processed based upon the spatial relationship between the bone and the vascular structures in the sub-volume, automatically determine the vascular structure using the one or more seed points, the one or more structure edges, and the set of image data and to subtract the vascular structure from the preliminary bone mask to generate a bone mask.

Suri discloses an apparatus for producing an angiographic image representation of a subject. Further, Suri discloses a method and apparatus for characterizing and tracking a vascular system in a three-dimensional angiographic image (Summary of the invention). In particular, in Suri, raw angiographic volume image data is acquired and pre-processed to produce an angiographic volume (Col. 8, lines 40-42). The pre-processed volume is input to a three-dimensional feature processor, which outputs a three-dimensional edge volume (Col. 3, lines 57-60). The edge volume is then processed on a slice-by-slice basis to identify vessel centers throughout the volume of interest, which are representative of the imaged vascular system (Col. 9, lines 1-4). In one embodiment, the processing includes removing any non-vascular dark or black regions in the angiographic volume by constructing a binary bone-air-muscle mask (Col. 11, lines 39-43). Each pixel of the image slice is assigned as either a black pixel or a gray pixel, corresponding to bone/air/vascular structures and tissue background respectively to generate an intermediate binary slice mask (Col. 12, lines 30-37). A mask processor removes the vascular regions from the intermediate mask (Col. 12, lines 42-43) and the resulting slice mask contains the non-vascular structures with the blood vessels removed (Col. 12, 51-53).

Applicants respectfully submit that Suri does not teach at least the step of generating a preliminary bone mask to differentiate bone and vascular structures from the image data set, wherein the preliminary bone mask is generated for a plurality of sub-volumes comprising the image data set, based upon a spatial relationship between the bone and the vascular structures in

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the plurality of sub-volumes, wherein each sub-volume is differentially processed based upon the spatial relationship between the bone and the vascular structures in the sub-volume as recited in claims 1, 14, 27 and 39.

Specifically, and as mentioned above, Applicants point out that the intermediate binary slice mask in Suri, is created by assigning each pixel in the image slice as either a black pixel corresponding to bone/air/vascular structures or a gray pixel corresponding to tissue background. See, e.g., Suri, col. 12, lines 28-37. In other words, the pixel classification performed by Suri generates an intermediate binary slice mask that *does not differentiate between vascular and non-vascular structures (i.e., bone structures)*. A mask processor subsequently removes the vascular regions from the intermediate mask (Col. 12, lines 42-43) and the resulting slice mask contains the non-vascular structures with the blood vessels removed (Col. 12, 51-53).

In contrast, in the present patent application, *the preliminary bone mask differentiates between bone and vascular structures in the image data set* and the preliminary bone mask is generated for various sub-volumes comprising the image data set, wherein each identified sub-volume varies in its degree of spatial separation between bone and vessel. See, e.g., Application, page, 11, lines 22-23. Specifically, and as recited in claims 1, 14, 27 and 39, the preliminary bone mask is generated to differentiate bone and vascular structures from the image data set and is generated for a plurality of sub-volumes comprising the image data set, based upon a spatial relationship between the bone and the vascular structures in the plurality of sub-volumes, wherein each sub-volume is differentially processed based upon the spatial relationship between the bone and vascular structures in the sub-volume. Accordingly, the sub-volumes thus generated, which have a good spatial separation between bone and vessel enables greater emphasis on techniques such as connected components to distinguish between bone and vessel structures. See, e.g., Application, page 12, lines 8-10. For example, the spatial separation determined between bone and vessel regions in the proximal sub-volume may be used to implement a much faster routine to extract bone and vessel. See, e.g., Application, page 13, lines 23-24.

Because, Suri does not disclose at least the step of generating a preliminary bone mask to differentiate bone and vascular structures from the image data set, wherein the preliminary bone mask is generated for a plurality of sub-volumes comprising the image data set, based upon a spatial relationship between the bone and the vascular structures in the plurality of sub-volumes, wherein each sub-volume is differentially processed based upon the spatial relationship between the bone and the vascular structures in the sub-volume, Suri cannot anticipate claims 1, 14, 27

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and 39. Accordingly, claims 1, 14, 27 and 39 and claims depending therefrom are believed to be clearly patentable over Suri as well as other prior art of record. This it is respectfully requested that the rejection of claims 1-6, 10-19, 23-31, 35-39 be withdrawn.

Rejections Under 35 U.S.C. 103

Claims 7-9, 20-22 and 32-34 were rejected under 35 U.S.C 103(a) as being unpatentable over Suri in view of US Patent No. US 6,351,571 B1 (hereinafter, "VanMetter"). For a *prima facie* case of obviousness, the Examiner must set forth the differences in the claim over the applied reference, set forth the proposed modifications of the reference, which would be necessary to arrive at the claimed subject matter, and explain why the proposed modification would be obvious.

As summarized above, all of the independent claims are believed to be patentable over Suri. The VanMetter reference has been reviewed with respect to the 35 U.S.C 103(a) rejection and does not supply the deficiencies of Suri in regards to the step of generating a preliminary bone mask to differentiate bone and vascular structures from the image data set, wherein the preliminary bone mask is generated for a plurality of sub-volumes comprising the image data set, based upon a spatial relationship between the bone and the vascular structures in the plurality of sub-volumes, wherein each sub-volume is differentially processed based upon the spatial relationship between the bone and the vascular structures in the sub-volume.
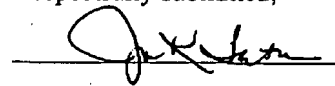
Applicants have further amended claims 7, 8, 20, 21, 32 and 33 to conform to the amended claim language of independent claims 1, 14 and 27 respectively. Accordingly, claims 7-9, 20-22 and 32-34 are allowable by virtue of their dependency from allowable base claims 1, 14 and 27 respectively, as well as for the subject matter they separately recite. Thus, it is respectfully requested that the rejection of claims 7-9, 20-22 and 32-34 under 35 U.S.C 103(a) be withdrawn.

In view of the foregoing amendment and for the reasons set out above, Applicants respectfully submit that the application is in condition for allowance. Favorable reconsideration and prompt allowance of the application are respectfully requested. Should the Examiner maintain this rejection, Applicants respectfully request an interview with the Examiner. Should the Examiner believe that anything further is needed to place the application in even better condition for allowance, the Examiner is requested to contact the Applicants undersigned representative at the telephone number below.

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Respectfully submitted,

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